SILVICULTURE

Enhancing Our Forest Resources

A Forest Renewal Program --1991-1996

Province of British Columbia
Ministry of Forests

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Minister's message

Forests are our most important natural resource. They provide a wealth of benefits to society, derived in many different ways — some from the undisturbed forest in its natural setting, and some from the forest products industries that depend on timber harvesting.

Our demands for all kinds of benefits from forest lands are growing. We want clean water, clean air, fish and wildlife habitat, grazing areas, wilderness reserves, parks, recreation areas and opportunities for tourism. In response, the British Columbia Forest Service has undertaken a number of initiatives:

- to provide a strategy for managing old growth;
- to identify and recommend the designation of wilderness areas;
- to manage community watersheds;
- to improve recreation opportunities;
- to work with other ministries in establishing parks; and more.

As we take care of these needs, and as we shift our dependence from our inherited forests to managed second-growth stands, we must also deal with the challenge of maintaining a reliable timber supply for the forest products industry. This industry continues to be the single greatest contributor to our provincial economy.

Today we must make the best possible use of all forest lands where timber is harvested. In part this means regenerating forests on harvested lands, and, since 1987, this has been a legal obligation of the harvester. But it also means carefully surveying our forests and researching opportunities to improve both the quality and growth of the young trees. After selecting superior seed, preparing planting sites, and ensuring the growth of new seedlings , we must carefully thin, space, fertilize and prune the growing trees to enhance their contribution to our future wood supply.

'Enhancing Our Forest Resources' is our commitment to do just that—to ensure the trees we grow will be in great supply and of high quality. Our success in this endeavor will contribute to our province's prosperity for generations to come.

Claude Richmond
Minister of Forests

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Summary

Silviculture, the art and science of growing trees, is moving into a new phase in British Columbia.

Since the 1930s, the Forest Service has concentrated on planting trees. Today, we have achieved the goal of ensuring that *all* currently harvested lands are promptly reforested.

The vision of the new phase, detailed in this five-year plan, is built upon several objectives.

- All remaining disturbed forest lands that are economically viable to treat will be reforested by the year 2000.
- A strengthened Forest Service will dramatically increase the enforcement of forest companies' legal obligations to replace forests currently being harvested.

This plan introduces a new emphasis on second-growth management, even as we catch up and keep up with basic reforestation. Incremental silviculture will apply modern forest management practices to our young forests to enhance their growth and improve wood quality. Silvicultural treatments will modify habitats, expand the use of forests by wildlife, improve the potential for recreation, and increase biological diversity.

In addition to improving current silviculture, other Forest Service programs will be funded to improve the management of our second- growth forests. Research into biodiversity, silvicultural practices, genetic improvement and forest-growth dynamics is a vital component of the program.

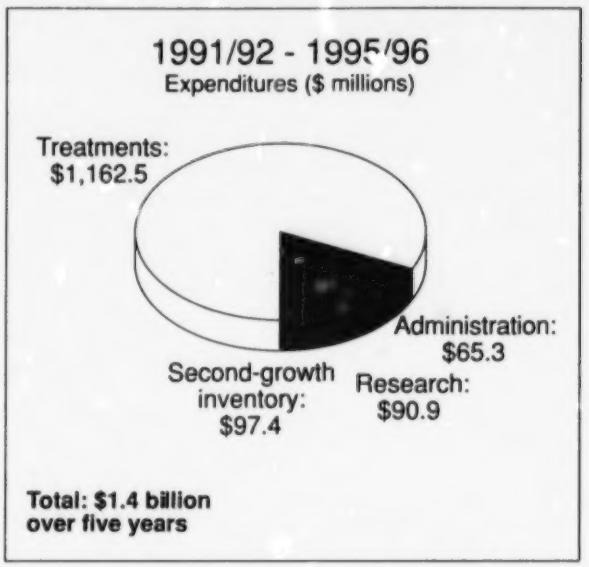


Chart 1: Forest Renewal Program expenditures for 1991/92 to 1995/96

Before major investments are made in specific areas of forest management, detailed evaluations of the existing forest resources must be made. Forest managers must understand how the forest responds to silvicultural treatments in order to predict the benefits we may receive from increased growth, improved wood quality, and enhanced non-timber resources.

An expanded inventory of second-growth forests is fundamental to the program.

Program highlights

A total of $1.4 billion will be invested over the next five years (see chart 1) in the Forest Renewal Program, the highlights of which are:

- the reforestation of most of the remaining pre-1988 not- satisfactorily-restocked (NSR) forest lands;
- auditing of forest company performance on basic silviculture to ensure no new NSR areas accumulate;
- an increase in incremental silvicultural treatments to enhance all forest resources and improve growth and wood quality;
- an estimated 3.6 million cubic metres of new growth annually;
- accurate measures of the trees and other resources of our second-growth forests;
- increased knowledge of forest dynamics, biodiversity, and silvicultural practices;
- 64,500 person years of employment for British Columbians ;
- many new harvestable forests with the potential to employ 450,000 people, earning $4.3 billion dollars in provincial revenues, and $16 billion in Gross Domestic Product over a 100-year period; and,
- long term social and economic benefits to communities dependent on forest resources.

Enhancing our forest resources

Vision for the future

Our province depends on its forests for its economic prosperity, healthy environment, recreational opportunities and scenic beauty. This means that the forests must be managed for the maximum benefit of all British Columbians now and into the future.

The future forest will have a productive land base supporting a wide variety of uses. Forests that are disturbed by harvesting will be fully reforested to established standards. Second-growth management will guarantee that our young forests continue to grow and remain a vital social and economic resource for British Columbians.

In areas where timber production is paramount, forests will be grown for maximum wood yield and quality. In other areas, forests will be grown to blend timber production with aesthetic, recreational, or wildlife values.

In areas where the forest should remain undisturbed, timber harvesting will be precluded, and the forest will be managed for its other resource values.

The basic principles in the realization of this vision are:

- biological diversity;
- integrated resource management; and,
- sustainable development.

This vision is an ambitious goal, but the principles are sound. The efforts of the Forest Service, in cooperation with several government ministries, the public and the private sector, will ensure its realization. The achievement of the goal will provide more jobs, a healthier environment, greater wealth and balanced options for future generations.

The forest today

British Columbians have prospered for many years from our forest heritage, but continued prosperity depends upon our investment in our second-growth forests.

The forest resources that produce benefits for British Columbians are spread over most of our province. Out of a total area of 94.8 million hectares, about half is productive for growing wood products. Of that, only 26 million hectares, or about 25 per cent of the province, is available for harvesting trees.

Basic principles

Biological diversity is a primary attribute of healthy, natural forests. Biologically diverse forests may contain a wide variety of flora, fauna and other creatures as well as:

- trees of varying species, sizes and ages;
- vegetation in various stages of succession;
- a dynamic collection of birds and insects;
- active decomposition; and,
- a broad range of wildlife.

The second-growth forests of the future will contain a mixture of tree species that complement one another, to increase both biodiversity and growth. Silvicultural treatments, such as spacing, will increase light to the forest floor, encouraging a variety of plant life to flourish, and offering food and habitat for many types of animals and birds.

This type of forest is environmentally healthy and aesthetically pleasing.

Biological diversity will be evaluated through inventory methods, examined under research projects, and expanded by integrating different forest types across the landscape.

Integrated resource management means that forest resources are managed for a combination of uses, which balance economic, social and environmental needs. Wildlife, water production, recreation, tourism and wood production are all valuable forest resources. The forests of the future will be managed to support many varied opportunities.

To understand the interactions of various forest uses, we must first assess the habitat that exists in our forests. Once research trials have assessed the consequences of various actions, silvicultural treatments will be chosen to preserve and enhance these habitats.

Sustainable development means that the forests are managed to provide a steady flow of economic and social benefits to the people of the province. Sustainable development requires that forest growth match or exceed forest depletion and that the quality of the resource is maintained or improved.

The value of wood products will increase in the future, as world- wide supplies are diminished. The value of high-quality wood will escalate even quicker. Growing more wood of higher quality will encourage industrial growth and diversification through secondary wood manufacturing in our province.

A forest renewal program

Most forest managers believe that as societal values shift and the population increases, the amount of forest land available for timber harvesting will decrease. Land may be set aside for parks and wilderness, urban uses, and preservation of certain ecosystems .

The shrinking forest land-base pressures forest managers to grow an equivalent volume of wood on less area, if the harvest level is to be maintained.

Pressures also arise from timber supply problems, such as reduced volumes per hectare, higher delivered wood costs and decreasing wood quality.

These problems relate, in part, to the historical management strategy of harvesting high-valued stands of accessible , over-mature timber.

Conversion of over-mature stands to vigorous second-growth stands results in higher annual growth per hectare, but on smaller trees at lower volumes per hectare and with generally lower wood quality.

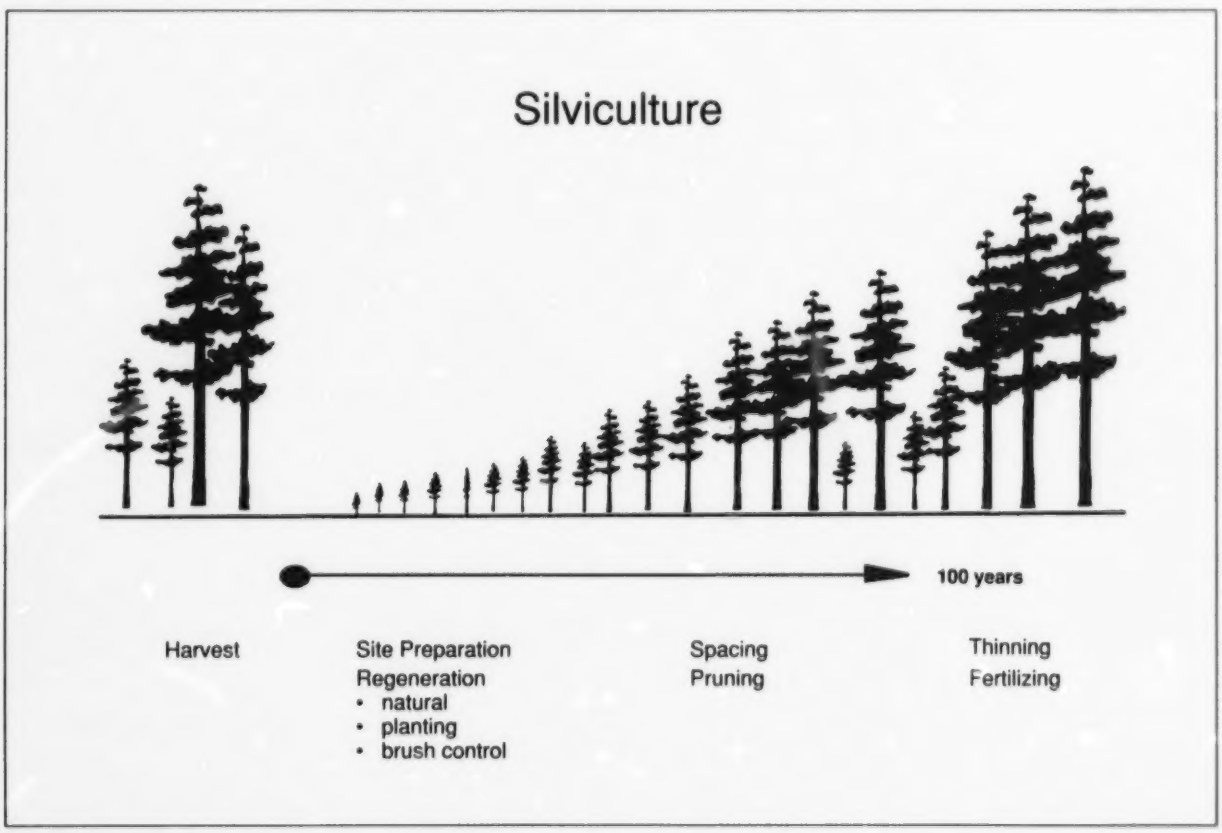
In recent years, the forest industry has accounted for:

- 50 per cent of B.C.'s manufacturing shipments;
- products totalling $12.5 billion in 1989;
- a 30 percent increase in manufacturing value since 1986; and,
- the direct or indirect employment of one quarter of a million British Columbians.

Although the economic benefits of the forest industry are of great importance to the province, forests are also critically important in sustaining a healthy environment for fish, wildlife, recreational and other non-timber uses.

Public attitudes and expectations towards managing our forest resources have shifted dramatically in the last 10 years.

A new emphasis is being placed on regenerating and enhancing our forests and on making them available for a variety of uses far into the future.



The program

Highlights

The program covers a five-year period, starting in 1991/92 and ending in 1995/96 fiscal year. It includes participation from the federal government as a contributor to the new four-year Forest Resource Development Agreement (FRDA), 1991-95.

The total expenditures, including the FRDA contribution of $90 million, will equal $1.4 billion over the five years (in current dollars). A strengthened Forest Service will administer and implement the program.

The program has been designed to include the involvement of forest companies in order to accomplish goals. The full support of other ministries and programs is required to achieve the program objectives.

Implementation

The program will be implemented through the cooperation of both the provincial and federal governments, several provincial ministries, Forest Service and industry staff, and independent forestry and silviculture contractors. The Forest Service has the lead role and will implement the majority of programs through its regional and district field offices as well as the silviculture, inventory and research branches.

A key part of the program is the recently announced new Forest Resource Development Agreement (FRDA). This four-year, $200-million, cost-shared agreement forms part of the program. Specific funding is provided for most of the incremental silviculture activities and silviculture research. Delivery of this program is shared between Forestry Canada and the Forest Service. Costs of the FRDA will be equally shared by both agencies.

All Crown forest lands are eligible for funding of silvicultural treatments. The Forest Service will hire contractors directly for most of the work. Tree farm licence holders and woodlot licence holders may also participate through work sharing agreements with the Forest Service.

The implementation of the program will significantly increase jobs. In order to deliver the program, the greatest increase will be in the fields of inventory, research and incremental silviculture, both in the private sector and the Forest Service

The size, expertise, and scope of the silviculture contracting community have grown dramatically in recent years. In 1988/89, an estimated 525,000 person days of private sector jobs were generated by the silviculture program.

Forest Service records list over 900 independent silviculture contracting companies, most of which are local businesses operating out of communities close to where the work is being done.

Additional jobs will be generated from associated and supply industries, such as private forest nurseries, which produced 90 per cent (254 million) of the seedlings in 1990/91.

The new program is expected to produce more than 2.5 million days of employment annually.

Subprogram descriptions

Many of the program's subprograms are concerned with establishing freely growing young forests on disturbed forest lands. The obligation associated with this objective is called basic silviculture.

Basic silviculture begins with using superior and genetically improved seed and high-quality seedlings to ensure maximum survival and growth after planting. Improved seed has been shown to increase growth by 15 per cent, with corresponding increases in wood quality.

Program's main objectives

1. To ensure reforestation obligations of forest companies and the Small Business Forest Enterprise Program (SBFEP) are completed to specified standards.
2. To ensure all economically viable areas disturbed by fire or pests are reforested.
3. To provide funding and resources to continue towards the goal of eliminating the treatable pre-1988 not-satisfactorily-restocked areas by the year 2000, or earlier.
4. To institute a significant second-growth incremental management program to improve the value and growth of future forests.
5. To resolve second-growth forest management issues through enhanced research.
6. To provide a more current and comprehensive inventory of second-growth forest resources.

Basic silviculture activities

Basic silviculture activities, used alone or in combination:

- **planning** - recording information for each area under management, recommending treatments, and projecting expenditures;
- **surveying** - taking inventory of areas and prescribing treatments;
- **site preparation** - preparing land for planting or natural reforestation;
- **planting** - producing higher-quality seed and seedlings and establishing them on disturbed areas;
- **brushing** - controlling competing vegetation to prevent the loss of planted or natural seedlings;
- **basic spacing** - thinning reforested areas to prevent growth from ceasing due to overcrowding; and,
- **auditing and monitoring** - confirming reforestation success and correcting failures.

Since the *Forest Act* was amended in 1987, major forest companies must have an approved 'pre-harvest silviculture prescription' (PHSP) before a harvesting permit is granted. Once the harvesting is completed, the companies must reforest the area to the standards specified in the PHSP.

The Forest Service's role is to monitor the forest companies' progress and to audit their success in creating free-growing forests.

It is also responsible to meet basic silviculture obligations on areas harvested after December 31, 1987, under the Small Business Forest Enterprise Program (SBFEP) and all productive Crown forest land disturbed by wildfire, pests or disease.

The Forest Service also continues to be responsible for reforesting Crown land which was disturbed before October 1987 and is not-satisfactorily-restocked (NSR). These areas include some of the pre-1982 backlog NSR areas that were not reforested under the recently expired Forest Resource Development Agreement (FRDA).

Current reforestation

The Current Reforestation Subprogram contains the initiatives required to ensure the prompt reforestation of all areas disturbed naturally or by man, since changes to the *Forest Act* on October 1,1987. This subprogram's purpose is to ensure sufficient staff and funding to fulfil this mandate.

Prompt reforestation of all newly harvested lands will ensure that :

- future British Columbians will not have to deal with a backlog of poorly reforested land;
- harvest levels can be maintained at their highest sustainable level;
- disturbed areas are reforested in the most effective manner; and,
- reforested areas contain the proper density of trees, of an ecologically suitable species, that are free from obvious hazards such as brush competition or disease.

Small Business Forest Enterprise Program (SBFEP)

Under the *Forest Act*, all lands harvested after December 31, 1987, under the SBFEP must be restocked to basic silviculture standards.

Silviculture activities funded by the SBFEP Account include: surveys, seed and seedling purchase, site preparation, planting, brushing and basic spacing.

The SBFEP began in 1988 with $2.8 million in annual silviculture expenditures and is expected to stabilize at $30 million by the year 1993/94. To implement this program, an estimated 110 employees are required — approximately one-third of the total silviculture field staff.These positions are funded from the Small Business Enterprise Account, but the allocation of staff will be from the Forest Renewal Program.

Fire and pests

To meet the Forest Service's mandate, as required by the *Forest Act*, the Fire and Pest Subprogram provides for basic silviculture on 25 000 hectares of forest lands disturbed by wildfires, insects and disease attacks, or other natural events. Activities under this subprogram prevent a reduction in the productive forest land base by ensuring that all of these naturally disturbed lands will be satisfactorily restocked.

Expenditures in 1990/91 totalled $2.9 million, used mainly to reforest areas in the Nelson region that were burned by several large fires in 1985 and areas in the Cariboo region which were damaged by mountain pine beetles over the last several years.

Funds under this subprogram include all costs associated with achieving free-growing forests on these areas. Seedlings required for this subprogram

will be contracted to private forest tree nurseries. Annual silviculture expenditures for this subprogram are expected to stabilize at $6.4 million with a total expenditure of $30 million over the five-year period.

This plan does not provide for reforestation of forest lands disturbed by future catastrophic events. The reforestation of these areas will require additional funding.

Auditing and monitoring

Forest Service staff evaluate the progress of major license holders and the SBFEP to achieve basic silviculture requirements by auditing and monitoring plans and accomplishments.

In the past, the level of auditing has been low because of the time lag between the start of the harvest under the new rules and the need to begin auditing silviculture performance. A substantial increase in auditing is scheduled to begin in 1991/92, as those areas harvested in 1988 become due for audits.

Failure to audit at adequate levels places the Forest Service at risk: if a forest company were to go out of business and leave a backlog of neglected land, then the Forest Service, as the ultimate steward of the land, would incur the basic silviculture liability. A delay in reforestation could affect future available wood supplies.

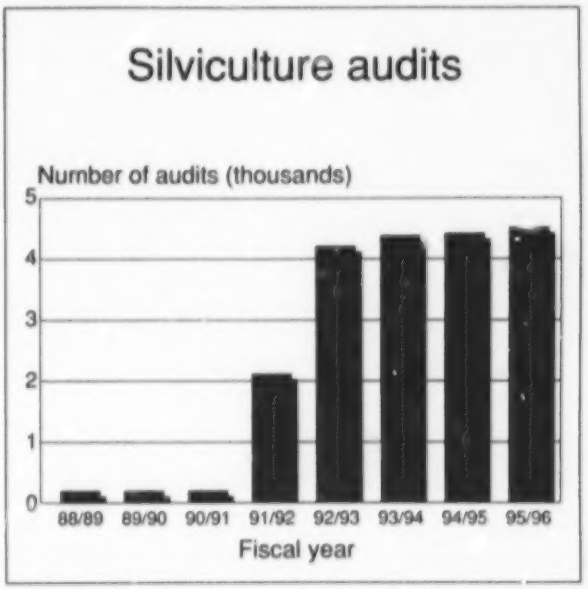
A newly defined audit policy has been developed to meet the changing requirements of legislation. The emphasis of the new policy is threefold:

1. An increase in field-checking major licensee pre-harvest silviculture prescriptions (PHSP's) before their approval, to ensure that the prescriptions are of a high standard.
2. Specific auditing levels have been determined for various stages of basic silviculture to increase the Forest Service's knowledge of the progress of the harvested areas towards a free-growing state.
3. A final assessment will be carried out on at least 50 per cent of the areas that are declared successfully reforested by major licensees, before the discharge of legal obligations.

The annual breakdown of the proposed audit schedule to the year 1995/96 is shown in Graph 1. By 1995/96 the Forest Service will b e conducting approximately 4,500 audits annually.

Outstanding obligations

This sub-program refers to the responsibility of the province to complete basic silviculture on all lands disturbed by harvesting or natural causes before October 1, 1987, when the *Forest Act* was changed.



Graph 1: Silviculture audit schedule

The two categories of outstanding obligations are: areas disturbed before 1982, often termed backlog; and areas disturbed between 1982 and October 1, 1987. To simplify and expedite field implementation, all of these obligations have been grouped together under the Outstanding Obligations Subprogram.

One objective of the program is to complete all outstanding obligations activities by the year 2000. This will increase forest growth by an estimated average of 2.2 million cubic metres annually over a forest rotation.

This subprogram involves all basic silvicultural treatments required to achieve a free-growing forest. Seedlings required for the Outstanding Obligations Subprogram are contracted to private forest tree nurseries or grown at Forest Service nurseries.

Activities are restricted to areas of Crown land that have not achieved a free-growing state. For areas disturbed before 1982, only the accessible good- and medium-site lands are proposed for treatment. The number of hectares requiring treatment will be refined as all remaining areas originally classified as not-satisfactorily-restocked are reviewed over the next few years.

A recent study confirmed that as the time following disturbance becomes longer, treating these areas becomes more difficult and costly. The projected plan for the next five years takes this into account.

Graph 2 shows how these pre-1988 reforestation obligations will decrease under this and subsequent programs by the year 2000.

Graph 2: Elimination of not-satisfactorily-restocked lands

Incremental silviculture

In our vision of the future forest, incremental silviculture will receive more emphasis due to ongoing issues facing forest management. The issues of diminishing wood supply, maintaining competitive markets, or reacting to changing public demands, revolve around the question of wood quantity and quality.

Incremental silviculture includes a wide variety of forest enhancing activities. The most widely used are:

- **juvenile spacing** -- thinning the forest to concentrate forest growth on a smaller number of trees;
- **fertilization** -- applying fertilizer to increase the forest's growth;
- **pruning** -- trimming lower branches to enhance the future value of individual trees;
- **commercial thinning** -- thinning merchantable trees to provide revenue from the forest and larger trees at final harvest; and,
- **auditing and monitoring** -- ensuring incremental silvicultural treatments are effective and providing the information needed to calculate the effects of treatments on forest growth and quality.

Incremental silviculture treatments are also effective in increasing biological diversity and in resolving integrated resource management concerns. Juvenile spacing opens up the young forest, offering more access to wildlife and more light for plant growth. Pruning, while improving the value of wood products, also makes branch material available sooner for decomposition.

These silvicultural treatments are not obligatory under law, but their need in some areas of the province is as critical as the need for basic silviculture.

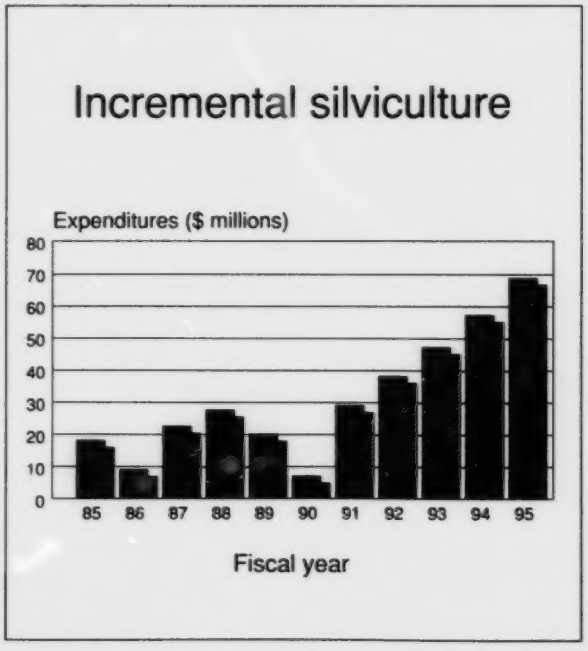
A recent computer simulated analysis indicates that an annual investment in incremental silviculture of $18 million could add 1. 4 million cubic metres of additional annual forest growth. In addition, 4,100 person-years of work would be provided and a $64 million net benefit to the province would be recognized (using a discount interest rate of four per cent).

These growth rates and economic benefits can only be estimated at this time, but countries like Sweden have demonstrated that they are achievable. Sweden is harvesting more wood now than in the past, while planting Canadian tree species on poorer quality land and in a cooler climate than that in B. C.

Given the opportunity for expanding our markets, a larger investment in incremental silviculture makes sense.

Incremental silviculture was funded under FRDA at approximately $2 0 million annually between 1987/88 and 1989/90. When the FRDA agreement expired, the provincial Sustainable Environment Fund (SEF) contributed $7 million for 1990/91. This decreased level of funding has had a significant impact on silviculture contractors.

The annual expenditures for the Incremental Silviculture Subprogram are shown in Graph 3.



Graph 3: Incremental silviculture expenditures

Second-growth inventory

To visualize and detail the vision of our future forests , a current and detailed inventory of all of the important forest resources is essential. The program will provide $97 million over five years for increased second-growth inventory.

See Graph 4 for the breakdown of annual expenditures.

Graph 4: Second-growth inventory expenditures

The program covers the main aspects of second-growth inventory:

- resource inventory and inventory update;
- statistical summaries and analyses;
- forest resource geographic information systems (GIS);
- growth and yield; and,
- remote sensing.

These activities support the attainment of silvicultural goals by providing growth analyses and mapping, and by monitoring the changing forest. The information collected will be used to plan specific projects, and to predict the effects of treatments on forest growth, wood quality and other forest resources.

New measurements and estimates are needed to inventory the second-growth forest resources. Non-timber values in our future forests, such as aesthetics or heritage, have to be recognized during inventory for use in forest planning and management.

The funding under this program will enable the Forest Service to accelerate towards completing the inventory of second-growth forests by the year 2000. Along with meeting this goal, the accuracy of our inventory will improve through the installation of more ground samples and the inclusion of cruise sample data.

The inventory update will maintain a current forest resources inventory by updating map sheets on a two-year basis for changes due to harvesting, wildfire , damage by insects or disease and stand treatments.

Forest resource Geographical Information Systems (GIS) involves converting map sheets and data into digital form so changes, summaries and analyses can be performed using computer software. Some of the benefits of converting to computerized systems are:

- integrated databases can be stored;
- computations, analyses, and projections can be performed that would be impossible without a computer; and,
- information can be reproduced and transferred electronically, rather than mechanically, with no reduction in accuracy.

By using remote sensing technology, harvested areas and roads are delineated on satellite imagery to confirm changes to the forest resources inventory every two years. Through the development of new methods of using remote sensing products, updating procedures will become increasingly cost-effective.

Given the current technology, the increase in funding provided through the program will enable the Forest Service to update all active map sheets on the required two-year cycle and achieve the objectives of the program.

Silviculture research

Under the program, silviculture research strategies will be developed to meet increasing demands across a broad spectrum of forest resource management issues. In the vision of our future forests, emphasis will be placed upon:

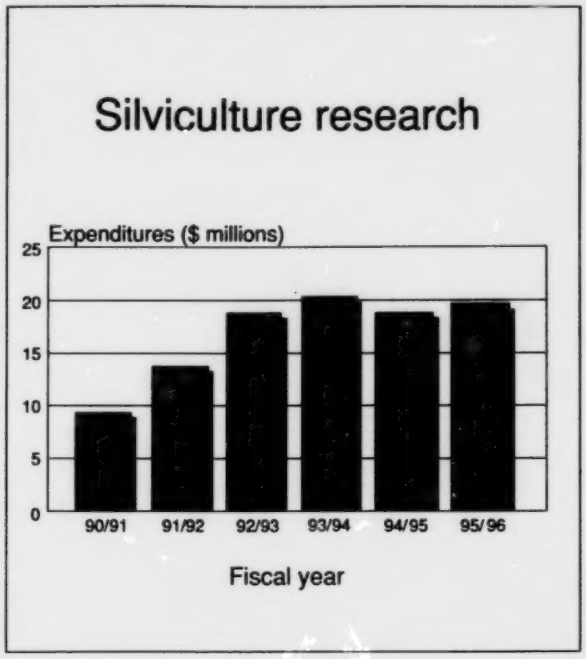
- new research to provide the reliable technical information required to address important emerging issues, e.g. second-growth management, clear-cutting and future timber supply;
- effective communication of research findings so that resource managers have the knowledge necessary to make informed decisions;
- establishment of Forest Service expertise in all major disciplines of forest research, so that high quality expert advice is readily available;
- addition of a social and economic component to silviculture research, allowing the development of more complete technical solutions to meet current public expectations; and,

- establishment of a network of long-term ecosystem-based studies so that sustainable development options have a biological foundation.

To help attain the vision of our future forests, the silviculture research subprograms will:

- improve the accuracy of current wood-yield projections and thereby reduce the risk and uncertainty in timber supply decision-making;
- estimate the value of second-growth stands and identify treatments to increase their value;
- evaluate the effects of clear-cutting and selection harvesting systems on wildlife habitat, regeneration capability, and forest yield;
- develop management options for the integration of wildlife, fisheries and range resources with timber harvesting;
- maintain the existing network of field trials to the free-growing stage, to evaluate biological and cost-effectiveness of treatments;
- develop new research in areas such as the selection of vegetation management tools, the silviculture of hardwoods, and plantation maintenance; and,
- provide a better understanding of the biology of reforestation, emphasizing effects on biodiversity, ecosystem functions and long- and short-term site productivity.

The Forest Renewal Program will provide $91 million for increased silviculture research into major forest resource issues in B. C . This funding includes $23 million from the new cost-shared Federal-Provincial Forest Resource Development Agreement to be delivered equally by each agency. Graph 5 shows the annual breakdown of expenditures.



Graph 5: Silviculture research expenditures

For more information

Please contact your local forest service office, or:

Silviculture Branch
B.C. Forest Service
31 Bastion Square
Victoria, B.C.
V8W 3E7